1896

Charbon or anthrax: with experiences during recent outbreak in north Louisiana

S B. Staples

SECOND SERIES,

No. 44.

BULLETIN

OF THE

LOUISIANA STATE EXPERIMENT STATIONS,

WM. C. STUBBS, PH. D., Director.

CHARBON OR ANTHRAX,

WITH EXPERIENCES DURING RECENT OUTBREAK IN

NORTH LOUISIANA,

— BY —

DR. S. B. STAPLES, D. V. S., and DR. W. H. DALRYMPLE, M. R. C. V. S.

ISSUED BY THE BUREAU OF AGRICULTURE. J. G. LEE, COMMISSIONER.

BATON ROUGE
PRINTED AT THE TRUTH BOOK AND JOB OFFICE.
1896.

LOUISIANA STATE UNIVERSITY AND A. & M. COLLEGE.

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OFFICE OF EXPERIMENT STATIONS,
Baton Rouge, La.

Hon. J. G. Lee, Commissioner of Agricu'ture and Immigration,
Baton Rouge, La.

DEAR SIR:—Last spring an epizootic of Charbon or Anthrax, of intensive virulence, prevailed in ten parishes in North Louisiana. A number of horses, mules and cattle, as well as other animals, died. This outbreak was peculiar both in the severity of the disease and the large extent of country taversed. An occasional local outbreak within the alluvial districts of South Louisiana has been occurring ever since the settlement of this country, but rarely so malignant in type or alarming in extent. Proper precautions, including rigid quarantine, have generally suppressed the disease without large losses.

Such a fatal and extensive outbreak as the one just alluded to, is fortunately very rare, occurring at long intervals apart. Information from reliable citizens puts the last occurrence in these same parishes in 1884, but the disease was far less fatal, and far more restricted in its area. Since that time this section has been practically free from Charbon.

During the prevalence of the epizootic, Dr. S B. Staples, veterinarian of the College and Station, and Dr. W. H. Dalrymple, M. R. C. V. S., of Baton Rouge, were both engaged in studying its origin and character, and checking its progress.

At my request they have prepared the accompanying paper on Charbon, giving its history, cause, modes of infection, symptoms, susceptibility and treatment, together with their individual experiences with this disease in the recent outbreak in North Louisiana.

As a means of diffusing correct information among our farmers and planters, concerning this dreadful and destructive disease, I ask that you publish their report as Bulletin No. 44.

Respectfully submitted,

WILLIAM C. STUBBS,
Director.

BATON ROUGE, LA., October 18, 1896.

Dr. W. C. Stubbs, Director, Audubon Park, New Orleans, La.

DEAR SIR :—In response to your request for a bulletin on "charbon," we beg to forward you herewith the following manuscript containing a somewhat general article on the subject, and at the end of which will be found some personal experiences with the disease in the State, more especially the serious outbreak which occurred in some of the northern parishes during the past summer.

We may state that in the preparation of this bulletin, the principal object we have kept in view is to spread information amongst our people regarding this disease so that a great amount of the ignorance which at present prevails may be dispelled, and rational ideas substituted regarding it.

We have nothing new to offer for the enlightenment of the scientific medical world, they being already in possession of all the known facts. On the contrary, we have drawn extensively upon some of the most eminent authorities for the major part of our article.

Briefly, we may say, that our effort here is directed solely to the education of the stockowners of Louisiana in this important disease which has for years been such a fatal animal scourge, and which may again appear at any time during the hot season, when favorable conditions exist or arise for its developement.

Yours very respectfully,

S. B. STAPLES, D. V. S.

W. H. DALRYMPLE, M. R. C. V.S.

borhood of Naples, Italy, that over 60,000 people perished through eating the flesh of animals which had died of anthrax. In 1731 it made its appearance in several provinces of France, notably in Auvergne, Bourbonnais, and in Languedoc. The years 1757, 1763, 1775, 1779, 1780 and 1800 were signalized by a charbonous malady which extended nearly all over France, and affected all the domestic animals. From 1800 to 1846, many outbreaks of this malady were observed, generally in the hottest months. In Russia during 1864, in the five governments of Petersburg, Novgorod, Olentz, Twer and Jaroslaw, over 10,000 horses and nearly 1000 persons perished from the disease.

It seems unnecessary to continue further the history of this disease. Its ravages may be said to be universal, and date from a very remote period. Authentic records of charbon in this country are somewhat scarce, and up to the present time literature on the subject relative to the disease in the Mississippi bottoms, where it has been prevalent at times for years, is exceedingly scant. This may be accounted for in some measure by the fact, that up to very recent years, intelligent investigations have rarely, if at all, been conducted and results recorded.

It was not until 1845 that anthrax was believed to be contagious, when in that year, Gerlach demonstrated it experimentally. In 1855 Pollender (Wipperfurth) announced that in 1849 he had found in the blood of cattle affected with anthrax, a considerable quantity of fine little sticks. These were also seen by Duvaine, of Paris, in 1850, and by Branell, of Dorpat, in 1857. This last author based his diagnosis of anthrax upon the presence of these little sticks in the blood, but he denied their disease producing properties. It was Duvaine, who, in 1863, recognized that these elements were bacteria, and that they constituted the specific agents of charbon. Cohn was the first who considered the little sticks bacilli, and suspected their forming spores (sporulation). Delafond was the first who tried the cultivation of anthrax rods (bacilli), and by exposing virulent blood to air, he said that these little sticks became lengthened. The renowned Koch, however, threw more light upon the development of spores, and their transformation into bacilli.

Preventive inoculation, which has been so extensively adopted during the late outbreak of the disease in the State, was discovered by Toussaint, and was then studied by Pasteur, Chauveau and others. A great deal could be said about the specific organism, the "bacillus anthracis," which is the cause of charbon, but that would lead us into the field of bacteriology, a subject which the majority of our readers may not be sufficiently familiar with to fully appreciate.

We will mention, however, that the bacillus anthracis, which is alone responsible for the production of this affection, belongs to the class known as "ærobes," that is, the presence of oxygen is absolutely necessary for its existence and sporulation. This point is one of great practical importance. The bacteria, in the rod stage, are destroyed by the process of putrefaction, hence they quickly disappear from carcasses exposed to the air. But this is not the case in those animals in which the viscera (internal organs) have been immediately removed, and more especially in the case of charbonous carcasses which have been bled and dressed. Putrefaction in this particular case, is much more tardy, and it is possible to find the charbon bacillus in the blood several days after death.

The bacillus and its spores might be roughly illustrated by an ordinary pea. The pea pod representing the bacillus or rod, and the peas the spores; remembering, of course, that the one with which we are dealing is microscopical in size.

It would seem that the bacilli of charbon, being destroyed by the putrefaction of the cadavers, the latter would not constitute a source of danger. But after the death of the diseased animal, all the bacilli are not destroyed; those which come into contact with the external air form spores, and these (spores) are completely resistant to decomposition. In bodies which have been skinned, a large number of bacilli are exposed, involving a more abundant production of spores than in those which have been left intact.

Bacilli accidently deposited upon the soil by diseased animals, finding themselves in contact with the air, and at a suit-

able temperature, will also form spores, which are preserved for a long time on the surface of the vegetation. According to some authorities, these spores can pass through the different phases of their evolution in the soil, and give rise to new generations.

The bacilli retain their virulent properties for a lengthened period in blood, when this liquid has been carefully collected and protected from the germs of decomposition. Dried blood also long retains its virulence; the bacilli are brought to the condition of latent life, and will again multiply, when under favorable conditions of humidity and temperature.

Germicidal agents act very differently on the bacilli and on their spores. For instance, one-quarter to one-half per cent. solutions of corbolic acid will kill the rods, while it requires a 5 per cent. solution to destroy the spores.

These few facts regarding the physical or biological properties of the organism have a most important bearing upon the necessity for the proper disposal of charbonous carcasses, which in reality is one of the most practical points to be considered in the sanitary science of the disease, and one of the chief factors in the successful eradication of an outbreak.

We have stated that the bacillus of charbon cannot live without the presence of oxygen, consequently when a diseased animal dies, the germ gradually succumbs, because its food supply, so to speak, in the form of the oxygen, which during life, the animal inhaled at every breath, is cut off. Should the carcass be cremated while still *intact*, and no excretions, either from natural or other openings, allowed to escape, all infection will be destroyed, and the chances of a further spread of the disease, from that individual carcass, reduced to a minimum. If on the other hand the carcass is mutilated, by hand or otherwise, or left exposed to the ravages of carnivorous or other animals, the body fluids or excrementitious matters containing the bacilli, exposed or allowed to escape, the organisms coming in contact with the atmospheric air will be again revivified, and sporulation (which does not take place in the living body) will commence, and by this means the surrounding ground and vegetation be-

comes infected, and may remain so almost indefinitely, with spores, and it is in this way that the disease is frequently contracted by animals grazing over the contaminated herbage. It may be inferred then, that grain or forage raised on an infected area and being infected with charbon spores is as liable to produce the disease when animals are fed in the stable, as when grazing over charbon infected pastures.

Another vehicle by which the disease is disseminated, is *water.* The germs are washed by rains and surface water into ditches, ponds, pools, creeks, bayous, etc., and may be transported great distances, producing the disease at distant points in animals partaking of the contaminated water.

DEFINITION.

Charbon may be defined as a specific fever affecting animals and communicable to man, and which is dependent upon the introduction into the system of a specific micro-organism, the bacillus anthracis.

There are three recognized ways by which the germ may penetrate into the animal body, viz: the alimentary canal, the lungs, and the skin, but it is exceptional for the disease to be transmitted directly from a diseased to a healthy animal.

1. Internal infection generates the form known as *intestinal anthrax,* which is usually produced by spores which are ingested (swallowed) with food or drink. This mode of infection is very frequent during the course of epizootics. The virulent elements penetrate the mucous membrane of the intestinal canal, even when it is intact, and thus gain entrance to the circulation.

2. Cutaneous or skin infection, produces the form known as *inoculating anthrax, external anthrax, carbuncular disease.* etc. This variety of the disease is brought about by some method of external inoculation. Animals having wounds coming in contact with the bacteria, either when lying out on infected pastures; the intermediation of utensils or instruments soiled by virulent matter, or the bites from blood sucking insects which have been feeding on charbonous blood.

3. Anthrax produced by *inhalation*, which is the rarest form.

In this mode of infection, the spores come in contact with the mucous membrane of the air tubes in the lungs. In *"wool-sorter's disease,"* and the *disease of rag pickers,* the fact has been clearly established that the mode of entrance of the virus is through the respiratory organs.

We think that the late outbreak of charbon, as we were confronted with it, was brought about and continued by the two first mentioned modes of infection, viz: the internal or intesti nal, and the external or cutaneous. Isolated cases, or perhaps occasional small outbreaks have, no doubt, occurred from time to time in portions of the northern parishes of the State, but not sufficiently extensive to cause anxiety or induce carefulness regarding further spread of the disease.

It has been the custom to simply haul carcasses out to the woods, which, unsuspectingly on the part of the owners, became a source of future trouble by contaminating the surroundings, or probably transmitting the disease to animals at a distance, or to flesh eating animals that devoured the carcasses.

In 1884, we are told, a rather serious outbreak occurred in the parish of Franklin, La., when a great number of animals succumbed, as well as some human beings from inoculation, through skinning the diseased carcasses for their hides.

It is difficult to say how or where the late outbreak originated, but it is possible that conditions, specially favorable to the development of the charbon organism, may have existed during last summer, and that the outbreak alluded to in Franklin, or sporadic cases elsewhere in that section, may have been directly responsible.

After the disease became existent, there can be no doubt whatever, that the chief factors in its extensive spread, were flies of different kinds, but mainly the blood-sucking varieties, and notably a small, grey horse-fly, the *tabanus lineola*, which were in such appalling numbers during the summer months, that they constituted a veritable plague.

The fly, however, is not as a great many of our people

imagine, the direct cause of charbon, but the indirect one by acting the part of a transmitter, when, after sucking the blood, containing the germs, of an animal affected with the disease, he alights on a healthy animal for a similar purpose and inoculates it with his soiled proboscis or mouth parts. It is also possible, and even probable, that the fly may deposit the bacteria through the medium of its excrements, on grass and herbage in the neighborhood of woods or swamps where it frequents, thereby infecting it, and when eaten by stock, transmits the infection by the internal mode. Another point worthy of consideration is, that after the fly, containing anthrax blood, dies, the bacilli may begin to sporulate on the ground, and in this way also, contaminate the pastures.

With reference to the *geologic*, *hygrometric* and *thermometric* conditions which favor the development of anthrax, authorities on the subject say it depends upon a certain composition of the soil, and determined conditions of moisture, temperature and vegetation.

It preferably exists in countries with dark, light soil, rich in organic matter; in regions with clay, lime, or calcareous soils which contain a small portion of organic remains; in those with a swampy, turfy character, and where the sub-soil is impermeable. Soil that is enriched with mineral substances or organic matter (manure deposits, mud coming from ponds), favor the development of the bacilli.

Anthrax is also influenced by the degree of moisture of the soil. It is sometimes observed in wet, swampy lands when they become partially dry during the hot season. Some observers state that cases of charbon are so much more numerous in proportion to the low level of underground waters and scarcity of rain. The same law applies to soil rich in mould; these are the most favorable for the development of bacteria when an elevated atmospheric temperature, after heavy rain or inundations, determines a very rapid decrease of the level of underground waters. This is the reason that anthrax is so frequent in low lands exposed to submersion.

Temperature conditions are also very important.

GENERAL SYMPTOMS.

The course of acute anthrax is generally so rapid (from 2 to 12 to 24 hours), that before any special symptoms, except those of an acute fever with rapid prostration are observable, death takes place. The temperature rises rapidly to 104 or 105 F or over. There are sometimes observed symptoms of brain affection, anxiety, excitement, stamping, bellowing, rabidness, convulsions, spasms, grinding of the teeth, stupefaction, weakness, staggering gait; finally apoplexy and death. In other cases there are symptoms of lung congestion, quickened and laborious breathing, groans, heart palpitations; a small, quickened pulse, which is almost imperceptible; bluish-red discoloration of the mucous membrane lining the nose and mouth, bloody discharges from the natural openings, convulsions, staggering gait, and death by asphyxia.

In the sub-acute form, the symptoms are much the same as in the acute, but the course is less rapid, generally from 12 to 24 hours on an average, and from five to seven days as a maximum.

In *external or cutaneous* anthrax, the tumors or enlargements are circumscribed, hard, hot and later they become gangrenous, cold and insensitive to pain. The fever may appear either before or after the development of the swelling.

The average mortality in anthrax is from 70 to 80 per cent. When an epizootic lasts for a length of time, its virulent character becomes gradually weakened, and cases of spontaneous recovery frequently occur.

SUSCEPTIBILITY OF THE DIFFERENT ANIMALS TO ANTHRAX.

The following is the order given by observers in relation to the receptivity of the various animals for the charbon virus: Ox, sheep, goat, horse or mule, stag, antelope, deer and camel; the cat, rabbit, guinea pig, mouse, dog, hog and fox.

SYMPTOMS OF CHARBON IN THE DIFFERENT DOMESTIC ANIMALS.

In the *Ox tribe.*—The acute form, without external localizations (swellings) is the most frequent. High temperature, accelerated pulse (80 to 100 or more per minute), small and imperceptible. The mucous membranes of the nose and mouth are

red and often dark colored. There is sometimes a flow of tears from the eyes. Weakness and stupefaction are very pronounced the appetite is gone, and the animal does not ruminate (chew the cud). The gait is uncertain; trembling of the body, especially the flanks and hind quarters. The expression of the countenance is very dejected.

Sometimes stupefaction is replaced by rabiform attacks; the patient bellows, scratches the ground, pushes against any obstacle, etc. The gastric trouble includes constipation, slight bloating, abdominal pain, diarrhœa, expulsion of bloody matter, etc. The urine often contains blood (hematuria), or is highly stained with the coloring matter of the blood (hemoglobinuria). Blood-stained liquids may be emitted from the natural openings, viz: mouth, nostrils, eyes, anus and vagina. General stupefaction, coma and weakness continue to increase, and death follows in convulsions within from twelve to forty eight hours.

Charbon tumors are sometimes observed in the ox, as primary accidents, at other times during the course of acute, or sub-acute anthrax. They may appear upon the head, neck, chest, shoulders, abdomen, sheath, milk glands, flanks and limbs.

In the *Horse or Mule.*—Generally speaking, the *acute and sub-acute* forms are the most common. High fever, quickened pulse, small and imperceptible (80 to 100 beats per minute). Fever accompanied by chills and convulsive contractions of the muscles. External temperature irregularly distributed. Mucous membrane of eyes, nose and mouth, dark colored, weeping, sometimes from both eyes. Expression sad. The animal is stupefied, and the gait is staggering. In some cases there is cerebral excitement. Abdominal pain, which may be accompanied by a liquid bloody discharge from the bowels. Breathing is quickened and laborious. Death, which is indicated by profuse perspiration, occurs within from six to thirty hours. Recovery is rare. External tumors are generally developed upon the abdomen, chest, inner surface of the limbs, the scrotum, external genitals, etc. This form has a somewhat slower course than the preceding, its average duration being from two to three days.

(This is the form which was prevalent amongst the horses and mules in the northern parishes.)

In *Sheep.*—Apoplectiform charbon is the most frequent in sheep. They suddenly present symptoms of apoplexy; they stagger, fall, and are affected with spasms, convulsions, black blood escapes by the natural openings. Death occurs in a few minutes.

Acute anthrax has a somewhat longer duration (from half an hour to two hours). It is sometimes marked by excitement, stamping, uncertain gait, etc; in other cases by congestion of the lungs, quickened respirations and pulse, discoloration of the mucous membranes, bloody or bloody-colored urine, bloody discharges by the natural orifices, etc. In some cases *anthrax tumors* are observed upon the head, throat and mamary glands.

In *the hog* —Enlargements of the throat, intense fever, copious flow of saliva, nausea, vomiting, discoloration of the mucous membrane of the mouth, difficult and quickened breathing, wheezing and rattling respiration, etc. Death occurs as a rule by asphyxia.

In *the dog.*—The disease is generally of the intestinal form, or localized swellings on the throat and cheeks. Infection is almost always produced by the ingestion of charbonous flesh.

In *poultry.*—Poultry usually become infected during the course of epizootics when they eat blood or meat of charbonous cadavers. Any of the domestic birds may become infected under such conditions. The disease has a very rapid course. Death may occur suddenly or within a few hours. The birds may fall from their perches, may be overcome by trembling and die in convulsions within a few moments. Bloody liquids escape from the mouth, nostrils and anus. In other cases the duration of the disease is about twenty-four hours; the patients are weak, and their feathers erect, the wings are hanging, the mucous membranes and the combs are dark colored. There is difficult breathing and bloody diarrhœa. In other cases, also, there are noticed tumors upon the comb, wattles, membrane of the eye, the tongue, palate, limbs and the membrane between the toes, etc.

In *man.*—Charbon in the human subject usually commences

by the inoculation of a wound in the skin when it is known as "malignant pustule." Those more liable to the infection are butchers, shepherds, tanners, skinners, meat cutters and veterinarians.

Those liable to contract the disease by *inhalation* are wool-sorters, mattrass makers, (from contaminated horse hair) rag-pickers, etc. The intestinal form in man is produced by the consumption of charbonous meats.

TREATMENT.

The treatment which was adopted during the outbreak in North Louisiana will be given later in connection with our individual experiences. We might briefly refer here to the preventive inoculation with anthrax vaccine. This agent consists in an artificial cultivation of the virus of charbon in certain media, and in the treatment of it by means of continued exposure to the atmosphere, or to a high temperature for a certain length of time, which weakens the virus to such an extent that it is only capable of producing a mild fever in the animal in which it is inoculated, and which yet has retained a sufficient amount of its power to protect the animal from inoculation of a stronger virus.

Pasteur's method of inoculation is in practice all over continental Europe, where experiments made in 1881 have given proof of the immunity conferred to animals by Pasteur's inoculation, and the inoculations made in France, and in many other countries, are absolutely demonstrative of its practical efficiency. Professor Chauveau, of Paris, has also a virus which has given excellent results.

Authentic records go to prove, that in European countries the mortality in live stock has been very materially reduced by the use of preventive inoculation.

As to the results following the use of the anthrax vaccine in our own State, they will appear later, and in some cases will be given by some responsible gentlemen who belong to the districts where the disease was most prevalent, and who had excellent opportunities for testing and witnessing the effects of this treatment.

THE DISPOSAL OF CHARBONOUS CARCASSES AND OTHER SANITARY AND HYGIENIC MEASURES.

All sanitarians are agreed that cremation or burning is the most effective method of disposing of carcasses of animals that have died of charbon.

When cadavers are buried, unless at a sufficient depth, there is the possibility of anthrax germs being brought up and deposited on the surface of the ground by earth worms. M. Pasteur has found, in the little rolls of earth deposited above a grave containing a charbonous carcass, the spores or germs of the disease. And these spores may be disseminated by the agency of winds, or more especially by water.

Professor Trasbot also records a remarkable case of infection of the soil by cadavers which were buried in a piece of woods. The ground which was cleared more than ten years after and turned into a meadow had remained infected. I have observed on the other hand, says Professor Trasbot, two examples of infection of the soil by an artificial substance containing blood. Two magnificent flocks of sheep were decimated by anthrax after the use of that manure; in the one case a natural mead ow, in the other upon a soil which was under cultivation with alfalfa.

A very important consideration seems to arise here with regard to the use of dried blood as a fertilizer. Should the blood which the fertilizer contains be contaminated with charbon spores the consequences may be very serious. And it is quite possible that many sporadic outbreaks, which seem unaccountable, arise from this cause.

In disposing of carcasses, every effort should be made to prevent the escape of blood or other fluid or excrement from the body. In cases where the carcasses have to be hauled some distance for cremation, a rough slide of some kind is perhaps the best vehicle, as it can be burnt when no longer required.

The most effectual and generally convenient method of burning, is to dig a trench, similar to a barbecue trench, with a sufficient number of green poles laid across it, on which the carcass is placed. The fire-wood can be put both below and around, and with the assistance of a little kerosene to start the fire, the

operation is performed much more expeditiously than by simply placing the carcass on the surface of the ground.

When an outbreak occurs on a plantation or farm, and the animals under control, the healthy stock should be removed to fresh surroundings, and the sick allowed to remain where they are (and the attendant should have no intercourse with the healthy stock), so as to circumscribe the area of infection. It often happens, however, that the opposite course is pursued, which results in the making of two or more infected places. All manure and litter ought to be gathered together and burned, and the ground disinfected with lime, crude carbolic acid, or some other good disinfectant. A good application for wood work, such as stables, fences, etc., is lime-wash mixed with crude carbolic acid. One pint of the latter to a bucketful of the former. When flies are prevalent, there are agents on the market which prevent them attacking the animals, but a cheap application, and one which we have recommended, is fish-oil emulsion. It may be made as follows:

Take common hard soap, half a pound; fish-oil, two gallons; water, one gallon. Dissolve the soap in the boiling water, and while still hot, add the fish-oil, and agitate the whole until the whole is thoroughly mixed.

For use, add to one part of the emulsion 8 to 15 parts of cold water, and apply all over the animals. The above are the proportions. A large or small quantity can be made as required.

Individual Experiences with the Disease in the State.

On June 7th, at the request of the Police Jury, a visit was made to examine and investigate an outbreak of charbon in Tensas parish, which had destroyed over three hundred head of mules, horses and cattle.

From St. Joseph I went to the plantation of Mr. J P. Harrison, and there found fourteen mules and horses, out of forty, sick from a disease supposed to be charbon. An examination showed that such was the case, and treatment with carbolic acid, internally and externally, was adopted in the manner set forth later.

The disease made its appearance on Mr. Harrison's place amongst the hogs and cattle, and killed some forty odd of the former in the pasture to which the horses and mules (afterwards taken sick), were allowed access. The cattle were in the swamp and died there, and they as well as the hogs, were never burned or buried, but left where they fell.

Pending the arrival of an order of 100 doses (1st and 2nd lymph) of Anthrax Vaccine, other affected plantations in the parish were visited. I next went to Mr. H. S. Nicholl's place where six head of stock had died, and examined thirty three mules and horses. With two exceptions, these animals were free from the disease, and of those two, one died. My next visit was to Newellton, where I found many cases. Mr. Cohn had seven mules, Mr. Wade Newell, nine, and Mr. R. Y. Newell, four mules and one horse sick. The last named had lost a number of cattle from the disease. There were also a score of isolated cases in the neighborhood which were examined. I next went to Mr. O'Kelly's, some eight miles above Newellton, and there found twenty two head affected. Twenty-three animals had been lost on the two plantations owned by Mr. O'Kelly.

I then returned to St. Joseph, and on receiving the lymph, proceeded to vaccinate forty head for Mr. Harrison; thirty-three for Mr. Nicholls, and eighty five for Mr. James P. Lynch, and others on the Tensas river.

The second lymph was left with the owners, accompanied by a syringe and directions as to dose and use. A great demand for vaccine being made by the stock-owners, an attempt was made to procure more, but it failed, as the Pasteur Company was out of the lymph, owing to the heavy shipments to the more northern parishes of the State.

The therapeutic treatment first recommended and adopted, was continued with a fair degree of success. It consisted of 10 to 15 drops of pure carbolic acid in a half pint of water, given internally every three hours, and a five per cent. aqueous solution of carbolic acid, (in some cases, 5 drops to equal parts of water), injected into the external swellings. These injections to be repeated in three to four hours if swellings increased. In cases where incisions or punctures had been made into the swellings, the solution was applied over the entire surface of the enlargements. In many cases coming under my notice, injections into small recent swellings caused an instant stoppage in the increase of the same, and a gradual decrease to a total disappearance in a few hours. Others remained the same size, became rather hard and nodulated, and disappeared in two to three days. In one instance an animal swelled in three different places at different times, and upon each of these being bathed in the carbolic solution, ceased, and went away in from four to twenty four hours.

Owing to the immense number of horse flies (tabanus lineola), which were the principal medium of infection, the preventive measures used, were especially directed to keep them off the stock, and the application used was fish-oil emulsion, the preparation of which will be found in another part of this bulletin. The well animals were also as far as possible, placed in lots free from any connection with dead or affected animals, or infected forage. All dead animals, as well as straw and other refuse in the lots on which discharges from affected stock had dropped, were burned.

Investigation of the possible causes of the extremely epizootic character of the disease in the parish, has led to the belief

that it was due to three causes, viz.: First and primarily, the extreme and long continued rainless weather which dried up the pools and sloughs on the bed of which grew grasses bearing the microbes, which had been deposited there in previous years. Second. The lack of attention bestowed on the proper disposal of dead animals, which were allowed to remain on the ground and decompose, or be lacerated and scattered over the ground by scavengers. Third. The large number of horse flies which appeared in all parts of the parish, voraciously attacking animals of all kinds. These were, in my opinion, the principal media of infection, as the probocis of the fly is serrated, and can easily carry infected matter from the sick and inoculate well animals.

In reference to mention in the treatment of "cuts and punctures in the swellings," the explanation is made, that nearly every owner of sick stock, had a different treatment, the principal part of which, however, was, in the majority of cases, "cutting with a sharp-edged iron heated red hot," or boring with the same. A great many also applied to the swellings a red hot shovel passed over some powerful blistering applications, either in contact with it, or in extremely close proximity. This treatment, I am convinced, if it did not kill, delayed recovery, and in many cases left large cicatrices and discharging surfaces.

A short time previous to the North Louisiana outbreak, at the request of a sugar planter, living a few miles above Baton Rouge, I visited his place to examine a couple of young bulls which were sick from a "mysterious disease." These were two of four bulls recently bought in Kentucky, two of which had previously died. One of the dead animals was in the stable when I arrived, and an examination showed that he had died from charbon. The two live ones both showed symptoms of the disease, and were swelled in different portions of the body. The treatment recommended was similar to that given above.

An investigation as to the source of the infection led me to conclude that it was due to the feeding on infected rice brain, as the disease broke out upon feeding from a new lot (of bran) which was purchased after the arrival of the bulls. It might be stated that the bulls were on the place for some weeks previous,

but showed no symptoms of disease until being fed upon the newly purchased feed.

The dead animals were ordered burned, and the feeding of the rice bran discontinued. No further trouble from the disease has been reported upon the place.

S. B. STAPLES, D. V. S.

In April, 1895, I was telegraphed for to visit one of our large sugar plantations to hold a post mortem examination on three mules that had died so suddenly that foul play was suspected. On my arrival I found the bodies very much bloated, and from the history of the cases and the general appearance of the carcasses, I was of the opinion that the disease was charbon. A post mortem was made upon one of the animals. An immense amount of gas in the abdominal cavity, due to rapid decomposition (death having taken place only a few hours before), fluidity of the blood, which was very dark in color (this is quite a symptomatic condition) due to the destruction of the integrity of the blood by the bacilli. A section of spleen (milt) was taken to Baton Rouge, and with the assistance of Professor W. R. Dodson, bacteriologist of the Experiment Station, the germ of charbon was identified in the blood under the microscope.

An old servant on the place informed me that he could not remember of a case of charbon on the plantation, and he had been there since the war. The food was suspected as the probable vehicle in which the spores had been transported, and rice bran was the only food stuff being used that had not been raised on the place. It was suggested that the use of the rice bran be discontinued at once. No more deaths occurred until about a fortnight afterwards, when three more mules died exhibiting similar symptoms. On inquiry I found that the same lot of rice bran had been again fed from. From this time forward, the bran was permanently discarded, and the disease stopped right there. Sanitary measures were adopted similar to those previously recommended, and which it is unnecessary to repeat. Here was an outbreak of intestinal anthrax where the disease

had been brought on to the plantation by rice bran contaminated with charbon spores, and there can be little doubt that the rice had been grown on an infected field.

In May of this present year I received a dispatch from Mr. W. H. Ward, general manager of the Ashly Company's plantations in Madison parish, La., to come at once as a serious disease, thought to be charbon, had developed amongst the mules on their Waverly property. I found the disease as Mr. Ward had suspected, exhibited chiefly in the external form and produced through inoculation by the horse and other flies previously mentioned.

It might be well to point out here that the primary enlargement or swelling, although only a locally infected area at the commencement, the disease may become general, through the multiplication of the bacilli and their obtaining entrance into the general circulation, which no doubt was the case in many instances.

Some time after the disease had subsided on the Ashly properties, I wrote to Mr. Ward asking him to furnish me with as much information as he could obtain regarding the history, progress and general statistics of the outbreak, and to give me his opinion as to the effects, beneficial or otherwise, of the vaccine treatment.

I should have stated that I at once suggested the protective inoculation, on being convinced that the virus was being distributed by flies, as nothing to my mind could offer such immediate, and for the time being, permanent protection, seeing that it had been so successful on the continent of Europe for a number of years. Acting on my suggestion, Mr. Ward at once ordered sufficient of the Pasteur Anthrax vaccine, available at the time in New Orleans. In fact he ordered more than sufficient for all his mules (about 400) as he was far-sighted enough to see that by helping his neighbors out in this matter, he was protecting himself.

The following is a copy of Mr. Ward's letter in reply to my inquiries:

ASHLY CO. LIMITED,
ASHLY, LA., July 24, 1896.

Dr. W. H. Dalrymple, Baton Rouge, La:

MY DEAR SIR: I have your letter of the 21st inst., asking me to furnish you with some information concerning the recent outbreak of charbon.

In reply I beg to say that so far as I have been able to learn the outbreak occurred at Delhi, in Richland parish, and supposed to have been brought there with some Texas ponies. From there the disease spread in all directions, and was fatal in almost every case in that immediate vicinity, but by the time it had reached the neighboring parishes it had assumed a milder form, and by the time the disease had reached East Carroll and Tensas parishes, I am told that four out of every five animals were cured.

In our own case we had the disease in its most violent form, as you are aware, losing every animal except one, that was affected up to the time we commenced to use the vaccine treatment. Between the first and second doses of lymph we had quite a number of new cases and a few deaths, but during this time the disease was in much milder form. We even had a few cases and two or three deaths during the first four or five days after the second dose had been applied, but when the twelve days had expired, we never had another case. I am a great believer in the Pasteur treatment, but I am a little puzzled to understand the experience of my neighbor, who used the vaccine at the time I did, and until a few days ago, with the same satisfactory results, but he has just lost two horses that had the second dose of the lymph nearly a month ago, and one of his mules that was vaccinated at the same time, and which he says had had two genuine cases of the disease before vaccination, is just getting well of the third attack, which came upon him at least three weeks after he had had both doses of the virus, and after he had had the real disease twice. My neighbor says there is no mistake about the mule having a genuine case each time. He also says that the negro who attends the stock has had two mild cases of the disease. I talked with the physician who treated the negro, in the first case, and he says it is a fact that he had charbon.

These are as near the facts as I am able to get them.

Sincerely yours,

W. H. WARD.

It is somewhat difficult to account for the idiosyncrasies exhibited by some animals, as in the three cases mentioned in this letter. The administration of these vaccines, antitoxins, etc., has to be conducted with anti septic precautions, such as the sterilization of the syringe, preventing as much as possible, contamination of the lymph by contact with the atmosphere and so forth, and it is possible, in the cases just cited, that this was not as carefully attended to as might have been.

After completing my investigations for the Ashly Company, I was requested to go to Delhi, in Richland parish, and there I found a similar state of affairs.

The following is a letter from Dr. J. M. Barrier, medical officer of the Board of Health at that place :

DELHI, LA., August 7, 1896.

Dr. W. H. Dalrymple, Baton Rouge, La.:

DEAR SIR : Yours of the 25th inst. to hand and I will endeavor to comply with your request with such information or data as I have, and if you can make use of it, or any part, I will have been fully repaid.

The first case of anthrax appeared in our parish in the vicinity of Delhi (date indistinct). Anthrax was not suspected in the first few cases, and it was not until several fatal cases had occurred on the plantation of Mr. ——— that the diagnosis of the disease was positively established. From this plantation it spread, until within one month it was epidemic in several of the surrounding parishes.

As to the origin of the first case, it is merely problematical. It is impossible that it should have developed *de novo*, but on the other hand it is equally impossible to ascertain the origin of the first case. There has been no epidemic of anthrax for several years. Sporadic cases have occurred, and as it has been demonstrated, the vitality of the anthrax spores may be retained for a number of years, it is my opinion and belief that this was the origin, viz : animals grazing on lands where the carcasses of anthrax animals had been thrown, or even where diseased animals had pastured. The topography and meteorological conditions of this section of the country are favorable for the development and spread of the disease.

After the first case it is easy to determine the manner the disease spread. There were never known before, so many flies, and undoubtedly these flies were the principal disseminators of the anthrax virus. The flies feeding on the blood of diseased animals, became full of anthrax bacilli (under the microscope, flies, and even mosquitoes have been found to contain countless anthrax bacilli), and then in turn light on healthy animals and inoculate them, the fly merely acting as carriers. The spread of the disease was furthermore increased by allowing the carcasses of the diseased animals to remain undestroyed until putrefaction and vultures could make the change, leaving the earth, and all vegetation, and any surrounding water, alive with anthrax spores. Any animals feeding on these lands, or drinking from these waters were liable to be infected. And as most of the cattle were affected with the internal form of fever, it is more than probable this is the principal way it spread amongst them. The climatic and local conditions all favorable, it was an easy matter for the disease to assume a most virulent form. It was not until the epidemic was at its height that the people could realize the necessity of burning all dead animals. There is no doubt in my mind that from the first case, had all dead animals been burned at once the epidemic could have been lessened in duration and severity. There were many noticeable predisposing causes in this epidemic. Well kept and good conditioned animals were not so liable to the disease, and the mortality among this class of animals, if attacked, was comparatively small.

Work stock were especially susceptible. The over-heated condition of the blood must have rendered these animals less immune. Fully 75 per cent. of all cases among horses and mules were plough stock. Loose animals running at large were almost entirely exempt. Young animals were comparatively safe. Home raised horses and mules were more exempt.

In this epidemic even hogs and chickens fell victims to the disease.

Another peculiarity of this epidemic, was a proneness to a relapse or second attack, and the last proving fatal in almost every case.

The three distinct forms of the disease appeared in this epidemic, viz.: the apoplectiform, the localized, and the internal

or anthrax fever. The first and last proving fatal in 90 per cent. The localized was more of a carbuncular-erysipataloid type attacking the throat and neck more than any other portion of the body. Though I have seen every part of the body affected, from the tip of the nose to the root of the tail. In all cases, I should say the mortality was half.

As regards treatment, there was not found a single satisfactory remedy. I heard of 1000 (?) that had never failed to cure a case. All these thousand were tried and as many more, but the animals died just the same. I believe many, however, were sent to "untimely graves" by over-medication. If I have any confidence in any treatment, it is the sub-cutaneous injection of a 5 per cent. solution of carbolic acid into the tumor as soon as it first appears. I saw this tried in a sufficient number of cases with such success, that I believe it does undoubtedly exert some curative powers.

The only successful treatment is, not curative, but preventive. At the beginning of an outbreak vaccinate all healthy animals with Pasteur's Anthrax Vaccine; isolate the well from the sick animals; burn all dead animals at once; give animals only pure, fresh water; keep the stables and premises perfectly clean; disinfect with lime and carbolic acid. I would advise that all animals be vaccinated every year before the appearance of the disease, and this terrible scourge will be as surely removed from our midst as small-pox has been by vaccination.

In this immediate community about 250 animals were vaccinated at the height of the epidemic. Not 3 per cent. of this number were attacked after first inoculation, and not 50 per cent. of this number died. Only two or three cases occurred after the second inoculation, and there were no deaths. All the while unvaccinated animals were dying on adjoining farms.

Yours, truly,

J. M. BARRIER.

In the beginning of June last, the Police Jury of Franklin parish requested me to proceed to Winnsboro, the parish seat, make an investigation, and report.

The disease proved to be, as in the previous cases, charbon.

On the evening of my arrival at Winnsboro a cow dropped dead on the street. I had the carcass taken to a suitable place,

and, before burning, I opened into it so as to secure a small section of spleen pulp, which I took to my hotel where I had a microscope, and some staining and mounting materials. The blood showed, under the microscope to be teeming with anthrax bacilli, a photograph of which, taken by Prof. W. R. Dodson is herewith given.

I sent a letter similar to the others mentioned to Hon. S. H. Cordill, Franklin parish, and the following is his reply:

COMO, LA, August 6, 1896.

Dr. W. H Dalrypmple, Baton Rouge, La.:

DEAR SIR: The charbon in this parish appeared among the stock about the middle of May. It seemed confined to the northern and eastern portions, in wards 3, 4 and 5. In other portions of the parish the disease was less prevalent, and not of such a virulent type. This same section was visited by charbon in 1884 in the spring, during a very wet season, and high water, and the buffalo gnats were bad. Hundreds of head of all kinds of stock died, and many people were affected, and some died from the disease. All those living, who were attacked, have scars to show for it. No carcasses were burned or buried at that time; no scientific treatment was resorted to, and nearly all cases were fatal. Since then up to date (1896) only a few scattering cases have been known, and the type was not malignant, and was easily controlled by blistering, etc.

In May of the present year, not at all similar to 1884, being very dry, no high water, no buffalo gnats, the disease suddenly appears without any apparent cause whatever. The year has been exceedingly healthy, but after April 15th the great drought set in; water became stagnant, range short, pastures dry, with millions of little grey horse-flies. Many attribute the spread of the disease to this fly, but it could hardly be originated by it. So, origin of the disease can only be accounted for as shown in agricultural works on anthrax or charbon. After the first few cases, the disease became very malignant and epidemic. It spread with great rapidity and was very fatal, all cases dying in a few hours. All remedies were resorted to with no success whatever, and until the arrival of yourself and Dr. King (Natchez, Miss.) no cases were successfully treated, and only a few then

Mules, especially horse mules, seemed to be more subject to it than other horse stock. Among cattle, all imported or blooded bulls were more subject to it, and all cases proved fatal. On my own place I never lost a case after using the vaccine treatment. I believe if the people had proper medicine, and would take prompt measures, the disease would not be so fatal, but everybody is slow to move, and the animal is generally past treating before medicine can be procured. I had my horses and mules in two distinct pastures. In one where I had a well, and pasture that had been cultivated, and where no stock had ever died of charbon, was where my mules and horses were sick. The other, where I had mares, colts and yearlings, a new piece of land, with a very impure water supply (sloughs and ponds) was a veritable graveyard in 1884, but in it I did not have a single case among horses, cattle or hogs. All the cases seemed to appear amongst the stock that were at work.

The exact loss here I cannot state, but it was considerable. The idea now is to resort to preventives, such as inoculation and other methods. These will have to be used each spring before grass puts up, as undoubtedly the disease originates from germs taken up from the earth.

Yours truly,

S. H. CORDILL.

In July I went to Tallulah, at the request of the Police Jury of Madison, to make there also, a general investigation, and suggest measures for the control and eradication of the disease. At this time, however, the disease was becoming much milder in type, and there was a very perceptible difference in the number of flies, they having proceeded eastward, and where in the beginning of the epizootic the mortality, in some instances, reached as high as 100 per cent., cases of spontaneous recovery were now commencing to occur.

While at Tallulah, the Police Jury of East Carroll parish wired me to come to Lake Providence. In this parish, which was one of the last to become affected, there were numbers of cases, but in a much modified form, and spontaneous recoveries, I might say, proved the rule. On one plantation, out of about

forty mules affected, there were no deaths, or at most only one.

During my visit to this parish I saw, what seemed to me a rather remarkable occurrence. In some of the fresh water lakes, and more especially those in which diseased carcasses had been thrown, the fish could be seen in great numbers floating on the surface of the water, dead.

It has always been considered that fish, on account of their low temperature, were refractory to anthrax, but at this time we had a temperature of 90 degrees Fahrenheit, or over, with an increased temperature of the water, and if fish are poikilothermic, i. e., their temperature influenced by that of their surroundings, (a point which I am not clear upon at this writing), it may be that by feeding on the charbonous carcasses they may have become infected and died of intestinal anthrax. This is a matter which could be proved by experiment, and is one worthy of further investigation, as it may have a very important bearing upon the public health. If it should be proved to be the case that fish are liable to contract the disease under these changed thermic conditions, it is quite possible for the disease to be transmitted to human beings who may eat the fish imperfectly cooked. Another mode of transmission might be through the medium of hogs that have eaten the infected fish, and the human subject partaking of the fresh pork in a rare condition.

TREATMENT OF ANTHRAX.

The preventive treatment suggested, and with apparent success, was first of all, and as early as possible, inoculation with the Pasteur Anthrax Vaccine. Spraying the healthy animals with the fish-oil emulsion already alluded to, and cremation of all charbonous carcasses (some parishes included in their ordinances, at my suggestion, the carcasses of all dead animals from whatever cause) and sanitary measures, such as isolation, quarantine, destruction of excrement, etc., mentioned previously.

CURATIVE TREATMENT.

In the early part of the outbreak, medicinal agents seemed powerless, the course of the disease being so rapid that the victims succumbed almost before any treatment could be attempted.

When the swellings could be detected at the very earliest stage, and while yet small, good results seemed to follow the injection of a germicidal agent into the enlargement. The object here being to destroy the virus which the fly had inserted, before it had been absorbed into the circulation. In other words destroy the locally infected area, and endeavor to arrest the disease in its incipiency. The agent prescribed was a 5 per cent. aquæous solution of pure carbolic acid, and to be injected into the swelling with an ordinary hypodremic syringe In some cases there was added to each ounce of this solution, two grains of bi chloride of mèrcury (corrosive sublimate) The latter solution had been recommended by Dr. Arnoldow in the treatment of malignant pustule in man. Vesication to be produced in the local swellings by any of the ordinary liniments composed of agents, such as hartshorn, turpentine, camphor, iodine, chloroform, etc., mixed with oil. Careful scarification at the most dependent part of the enlargement. Personally, I looked for more satisfactory results from the hypodermic injection of the germicidal solution, when administered before absorption took place, than in any of the other external methods of treatment, and this opinion is shared by Dr. Barrier, as will be seen from his letter, who has had extensive experience with it during the outbreak.

Internally, I adopted the treatment recommended by Duvaine, of Paris. A laxative dose of Glauber, or Epsom salt combined with calomel, say 4 to 6 ounces of the salt, with 20 grains of calomel and sufficient water to form a drench. This to be given three times in one day. Also the following mixture: Iodine crystals, 1 ounce; Potassium Iodine, 2 ounces; Pure water, 12 ounces. One to two tablespoonfuls of the mixture to be given in a quart of water every 2 to 4 hours.

I cannot leave the subject of treatment without a passing word regarding some of the heroic, nay barbarous, methods used by some who *presumed* to know, but who were entirely ignorant of the disease in any of its phases. I have no hesitation in saying that many valuable animals died, not from charbon, but from the agonizing and excruciating pain produced by powerful escharotics. I have seen animals that had one large continuous suppurating sore extending from the lower lip to the flank. The

application of concentrated lye, red-hot shovels, the parts saturated with turpentine and then set fire to etc., are all relics of an age of barbarism. In this 19th. century, with its wonderful scientific advancement, it seems almost a reflection on our civilization, that we are still to be found in the thraldom of superstition and empiricism, with regard to rational and humane methods of treating our dumb servitors. Such conditions, however, I feel sure are gradually giving place to more enlightened methods and I believe that although the outbreak of charbon, so often referred to here, has been the cause of immense loss to many, it has been the greatest educator of our people, concerning this particular ailment, than anything else that has ever happened. Our people are now better prepared than ever before, should a similar plague again visit their live stock. They are equipped with more intelligent ideas regarding the true nature of the malady, and with more rational methods wherewith to combat its ravages.

There is one fact that should be kept prominently in mind, which is, that the successful control and extermination of a contagious disease, as the one under consideration, depends almost entirely upon sanitary science. The treatment of individual cases is of secondary importance, if the cause and spread of the disease remain unchecked. Remove the cause, or which amounts to the same thing, protect the animals by all possible means, and the effect will cease.

Before closing, I would like to add a few remarks relative to a condition seen in some sections of the State, and thought by many to be charbon, and as all cases, or at least a large majority of them would recover, that is, the enlargement disappear, without any external treatment, the "charbon doctor" generally makes a powerful impression with his "sure shot" liniment or other nostrum.

The swelling I allude to is that seen usually in the Spring when the animals are brought up to commence work in the field. It sometimes extends all along the under surface of the abdomen, and may involve the milk glands of the mares, or the sheaths of the horses.

To anyone giving the matter a little intelligent thought, the reason is obvious. On many cotton plantations or farms, the

mules, after the work of the season is over, are turned out to gather their living between the rows in the cotton fields, where they remain, it may be for several months, without receiving any grain food whatever. During this time the system, or I might say, the digestive organs, become accustomed to this particular kind of aliment which is easy of digestion, but when the Spring arrives and the mules are required to break ground, they are brought up probably the day previous, and from the light, easily digestible food, to which they have been accustomed for months, they are suddenly changed to a highly nitrogenous, carbonaceous and stimulating grain ration. The result is indigestion. The digestive system is not prepared for such a complete and sudden change. The whole system is in a relaxed (soft) condition, and there is a transudation of the watery constituents of the blood gravitating to the floor of the abdomen and producing an enlargement by infiltrating the sub-cutaneous (underneath the skin) tissues.

To prevent this condition, the animals should receive a little grain daily for a week or two before they are required for work, and the amount gradually increased until it is brought up to their hard working ration. To remove the enlargement, a laxative dose of medicine, as a half pound of Glauber salt dissolved in a quart of water and afterwards followed by a tonic, such as quarter-ounce doses of copperas in the food, should be given, and the diet carefully regulated, so that the system will gradually regain its normal tone, and absorption of the swelling will take place. There is no necessity for the usual heroic remedies (?) in vogue, some of which I have alluded to, because the enlargement is the effect and not the cause. This is the kind of charbon (?) that is so often cured (?).

So for as I have been able to ascertain, the recent epizootic of anthrax spread to about ten parishes.

W. H. DALRYMPLE, M. R. C. V. S.

LITERATURE CONSULTED :

Pathology and Therapeutics of the Domestic Animals. (Friedberger & Frohner. Zuill's Trans).

Principles and Practice of Veterinary Medicine. (Williams).

Veterinary Microbiology. (Mosselman & Lienaux. Dinwiddie's Trans.)

Bacteria and their Products. (Sims Woodhead).

Journal of Comparative Pathology and Therapeutics. (Mc Fadyean).

Special Reports on Diseases of the Horse and Cattle. (U. S. Dept. of Agriculture).